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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/561,266	11/17/2006	Alessandro Casalini	282367US0X PCT	5853
22850	7590	05/27/2010	EXAMINER	
OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, L.L.P. 1940 DUKE STREET ALEXANDRIA, VA 22314			SALVITTI, MICHAEL A	
			ART UNIT	PAPER NUMBER
			1796	
			NOTIFICATION DATE	DELIVERY MODE
			05/27/2010	ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

patentdocket@oblon.com  
oblonpat@oblon.com  
jgardner@oblon.com

<b>Office Action Summary</b>	<b>Application No.</b> 10/561,266	<b>Applicant(s)</b> CASALINI ET AL.	
	<b>Examiner</b> MICHAEL A. SALVITTI	<b>Art Unit</b> 1796	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 04 February 2010.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 17-39 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 17-39 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)                        | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Specification*

The disclosure is objected to because of the following informalities:

Regarding solubility parameters: The solubility parameters for the rubbery particles are unitless (page 12, lines 5-12 of instant specification). Solubility parameter is not a unitless measurement; it is measured in units of  $\text{cal}^{1/2}\text{cm}^{-3/2}$  or  $\text{MaP}^{1/2}$  (see page 2 of cited *Burke* reference).

Regarding cited art: The cited reference "CRC Handbook of Polymer-Liquid Interaction Parameters and Solubility Parameters" by Allan F.M. Barton (see page 12, lines 1-5 of instant specification) is not of record and could not be obtained by the Office. This reference, which teaches the solubility parameters in accordance with the claimed invention needs to be made of record.

Appropriate correction is required.

### *Claim Objections*

Claim 34 is objected to because of the following informalities: Line 2 of the claim contains no space between "claim" and "33".

Appropriate correction is required.

### *Claim Rejections - 35 USC § 112*

The following is a quotation of the second paragraph of 35 U.S.C. 112:

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The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 17-39 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding claims 17 and 29: Claims 17 and 29 recite the limitation "...the rubber of solubility parameter  $\delta_1$  and the rubber of solubility parameter  $\delta_2$  are incompatible,  $\delta_1 - \delta_2 \geq 0.5...$ ". The lack of units makes this comparison indefinite; see *Burke* reference. For the purposes of further examination, the differences in solubility will be calculated in accordance with the units of the closest reference of record (CRC Handbook of Solubility Parameters and Other Cohesion Parameters" by *Barton* Edition 2, 1991, page 406) in the units of  $\delta\text{MPa}^{1/2}$ .

Regarding claim 26: Claim 26 recites the limitation "process" in line 1. There is insufficient antecedent basis for this limitation in the claim. Claim 25, on which claim 26 is dependent, recites a mass-continuous process. For the purposes of further examination generic term "process" will be interpreted to be the "mass continuous process" of claim 25.

Regarding claim 39: Claim 39 recites the limitation "(pre)polymerization" in line 2. There is insufficient antecedent basis for this limitation in the claim. It is indefinite as to whether this refers to the pre-polymerization step (which has antecedent basis in claim 29), or whether the parenthetical "pre" refers to the polymerization process as a whole. For the purposes of further examination, "(pre)polymerization" will be interpreted as the step occurring in "ii)" of claim 29.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 17-19, 23-25, 27-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,545,090 to *Demirors et al.* in view of U.S. Patent No. 4,493,922 to *Echte et al.* A table from "CRC Handbook of Solubility Parameters and Other Cohesion Parameters" by *Barton* (Edition 2, 1991, page 406) is used for supporting evidence.

Regarding claim 17: *Demirors* teaches a mass-continuous process (*Demirors* col. 2, lines 55-68 and col. 9, lines 15-18) for the preparation of a rubber-reinforced vinyl aromatic copolymer. This process consists of:

a.) preparing a solution of rubber particles and at least one vinyl aromatic monomer (dissolving rubber in styrene monomer; *Demirors* col. 6, lines 55-58). The rubber comprises a bimodal mixture of polymer particles (*Demirors* col. 6, lines 23-30), which are homopolymers (100%) of 1,3 alkadienes (e.g. butadiene, isoprene, chloroprene, piperylene; *Demirors* col. 3, line 65 through col. 4, line 10).

b.) the solution is polymerized at 60-190°C in the presence of initiators (*Demirors* col. 10, lines 13-16). Chain transfer agents are taught (*Demirors* col. 10, lines 5-6).

c.) the vinyl aromatic (co)polymer is recovered (*Demirors* col. 9, lines 59-61).

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The recovered rubber-reinforced vinyl aromatic (co)polymer consists of 80-98% styrene (calculated from subtraction of rubbery particles) and 2-20% grafted and occluded rubbery particles (*Demirors* col. 5, lines 50-57). Of the rubber particles, 20-60% have "core-shell" morphology (i.e. 0.1-2 microns) and 20-60% have "salami" morphology (i.e. 2-8 microns); (*Demirors* col. 6, lines 17-22). In the case where the claimed ranges overlap or lie inside ranges disclosed by the prior art a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191USPQ 90 (CCPA 1976). See MPEP § 2144.05. At the time of the invention, it would have been obvious to a person having ordinary skill in the art to optimize the ratios of the core-shell and salami particles taught by *Demirors*, with the motivation of obtaining a desirable balance of impact and tensile properties (*Demirors* col. 2, lines 13-15 and col. 5, lines 18-25).

*Demirors* teaches towards a strictly bimodal distribution in the grafted and occluded rubber particles; in that in the most preferred embodiments, the smaller particles have a diameter of at most 1.5 microns, and the larger particles have a diameter of maximum 2.5 microns (*Demirors* col. 6, lines 23-30). This embodiment meets the applicant's definition of "strictly bimodal", in that particles of intermediate size will not be in between the two classes. *Echte* also teaches strict bimodality (no overlap in particle sizes b1 and b2; *Echte* col. 1, lines 45-50). *Demirors* and *Echte* are analogous art in that they are drawn to the same field of endeavor, namely high-impact polystyrenes (HIPS) utilizing bimodal 1,3-alkadiene rubbery particles. At the time of the invention, it would have been obvious to a person having ordinary skill in the art to ensure that the particles of *Demirors* have the preferred bimodality, with the motivation

of ensuring that the product has a combination of high gloss and good mechanical strength (*Echte* col. 1, lines 25-30).

*Demirors* neither teaches the solubility parameters  $\delta$  of the rubber components nor states whether the rubber particles must have a difference in solubility parameter  $\delta_1 - \delta_2 \geq 0.5$ . *Echte* shows impact-resistant polystyrenes containing particles of a bimodal distribution, wherein the particles (b1) (i.e. "core-shell") comprise 60-95% by weight polybutadiene (with styrene as the balance; *Echte* col. 1, lines 47-48 and col. 2, lines 17-20). The particles (b2) (i.e. "salami") comprise 5-40% polybutadiene, and the balance styrene (col. 1, lines 49-50). The table from *Barton* is copied below:

**TABLE I**  
**Preferred Hildebrand Parameter**  
**Values for Selected Polymers**

Polymer	$\delta$ /MPa <sup>1/2</sup>
Polyacrylonitrile	26
Polybutadiene	17.0
Poly(methyl acrylate)	18.5
Cellulose acetate	24
Cellulose nitrate	21
Polychloroprene	18.5
Poly(dimethylsiloxane)	15.5
Ethyl cellulose	20
Polyethylene	17.0
Poly(ethylene oxide)	24
Poly(ethyl methacrylate)	18.5
Polyisobutylene	16.5
Polyisoprene	17.0
Poly(methyl acrylate)	20.5
Poly(methyl methacrylate)	19.0
Polypropylene	16.5
Polystyrene	18.5
Poly(tetrafluoroethylene)	13
Poly(vinyl acetate)	20
Poly(vinyl chloride)	19.5

On a weight-average between 5% polybutadiene and 95% styrene, the examiner calculates the "salami" particles to have a  $\delta_1$  of 18.42  $((0.05 * 17) + (0.95 * 18.5))$ . At

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95% polybutadiene and 5% polybutadiene, the examiner calculates the "core-shell" particles to have a  $\delta_2$  of 17.075  $((0.95 * 17) + (0.05 * 18.5))$ . This is a difference of :  $\delta_1 - \delta_2 = 1.345$ . At the time of the invention, it would have been obvious to a person having ordinary skill in the art to use the process taught by *Demirors* to incorporate rubbery particles with a difference in solubility parameter  $\delta_1 - \delta_2 \geq 0.5$  (as taught by *Echte*), with the motivation of creating an impact-resistant styrene combining high gloss and good mechanical properties (*Echte* col. 1, lines 27-35).

Regarding claim 18: The combination of *Demirors* and *Echte* teaches the rubber-reinforced vinyl aromatic polymer obtained by the process of claim 17, as set forth above.

Regarding claim 19: *Demirors* teaches the process, wherein particles with a "core shell" morphology with an average diameter of 0.2-1.5  $\mu\text{m}$  and particles with a salami morphology from 2.5-5  $\mu\text{m}$  (*Demirors* col. 6, lines 23-30). These particles overlap with the recited ranges, but the "core shell" particles have not been held to overlap with sufficient specificity.

*Echte* teaches a rubber-reinforced vinyl-aromatic copolymer (col. 1, lines 7-12). This polymeric material comprises a vinyl aromatic polymer matrix (polystyrene) from 70-97% (col. 1, lines 41-43), and bimodal particles consisting of:

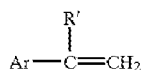
- 1.) "core-shell" particles (0.2-0.6  $\mu\text{m}$ ; col. 1, lines 47-48) 60-95% wt. (col. 2, lines 4-5)
- 2.) "salami" particles (2-8  $\mu\text{m}$ ; col. 1, lines 49-50) at 5-40% wt. (col. 2, lines 27-30).



In *Echte*, the particle sizes of both core shell and salami particles have been held to overlap the instant claim with sufficient specificity. In the case where the claimed ranges overlap or lie inside ranges disclosed by the prior art a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191USPQ 90 (CCPA 1976). See MPEP § 2144.05. At the time of the invention, it would have been obvious to a person having ordinary skill in the art to optimize the particle size, with the motivation of enhancing the glossiness and mechanical properties (*Echte* col. 1, lines 27-30), which are directly dependent on the particle morphologies (*Echte* col. 1, lines 30-35).

Regarding claim 23: *Demirors* teaches the process, wherein isoprenes are a preferred 1,3 conjugated diene (*Demirors* col. 3 line 65 through col. 4, line 10) from a short list of 1,3 dienes. Viscosities of 300 centipoise are taught (*Demirors* col. 4, lines 12-24).

Regarding claim 24: *Demirors* teaches the process, wherein the vinyl aromatic is (*Demirors* col. 3, line 25):



R is hydrogen or methyl and Ar is an optionally substituted aromatic ring (*Demirors* col. 3, lines 27-30). Styrene, alpha-methyl styrene, and other named compounds teach the recited structure with sufficient specificity (*Demirors* col. 3, lines 25-40).

Regarding claim 25: *Demirors* teaches the process, wherein the rubber-reinforced vinyl aromatic (co)polymer is prepared with an inert solvent (*Demirors* col. 7,

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lines 10-13) present at 2-30% by weight (*Demirors* col. 7, lines 25-27). In the case where the claimed ranges overlap or lie inside ranges disclosed by the prior art a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191USPQ 90 (CCPA 1976). See MPEP § 2144.05. At the time of the invention, it would have been obvious to a person having ordinary skill in the art to optimize the solvent between 5-20% by weight, with the motivation of managing the processability and heat transfer during polymerization (*Demirors* col. 7, lines 20-25).

Regarding claim 27: *Demirors* teaches the process, wherein initiators are added in a quantity of 100-1,500 ppm of initiator by weight of the polymer (0.01-0.15%; *Demirors* col. 8, lines 37-47).

Regarding claim 28: *Demirors* teaches the process, wherein 0.001-0.5% chain transfer agents are used (*Demirors* col. 10, lines 5-13).

Claims 20-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,545,090 to *Demirors et al.* in view of U.S. Patent No. 4,493,922 to *Echte et al* and evidence from "CRC Handbook of Solubility Parameters and Other Cohesion Parameters" by *Barton* (Edition 2, 1991, page 406), as applied to claim 17 above, and further in view of U.S. Patent No. 5,942,575 to *Monti et al.*

Regarding claims 20-22: The combination of *Demirors* and *Echte* teaches the process of claim 17, as set forth above.

*Demirors* is silent regarding the process wherein the rubber  $\delta_1$  being a linear diblock rubber of S-B type, wherein S is a polystyrene block having an average

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molecular weight MW between 5,000-80,000 and B is a polybutadiene block with an average molecular weight MW between 2,000-250,000, wherein the S-block is 10-50% by weight of the rubber. *Monti* teaches rubber-reinforced vinyl aromatic polymers wherein S is a polystyrene block having an average molecular weight MW between 5,000-80,000 and B is a polybutadiene block with an average molecular weight MW between 2,000-250,000; the S-block comprises 10-50% by weight of the S-B rubber (*Monti*, 3:58-4:3). *Monti* shows an example wherein the polystyrene S block content is 40% by weight and the viscosity in 5% styrene is 40 cPs (col. 5, lines 40-45). *Demirors* and *Monti* are analogous art in that they are drawn to the same field of endeavor, namely rubber-reinforced vinyl aromatic compositions prepared by mass-continuous processes. At the time of the invention, it would have been obvious to a person having ordinary skill in the art to ensure that the particles of *Demirors* have the molecular weights of *Monti*, with the motivation of ensuring that the particles are capable of forming fine-morphology in the polymer matrix (*Monti* col. 3, lines 55-60).

Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,545,090 to *Demirors et al.* in view of U.S. Patent No. 4,493,922 to *Echte et al* and evidence from "CRC Handbook of Solubility Parameters and Other Cohesion Parameters" by *Barton* (Edition 2, 1991, page 406), as applied to claim 25 above, and further in view of U.S. Patent No. 5,942,575 to *Monti et al.*

Regarding claim 26: The combination of *Demirors* and *Echte* teaches the process of claim 25, as set forth above.

*Demirors* is silent regarding the process wherein the solution is prepared in a mixer maintained at a temperature not higher than 100°C. *Monti* teaches that mixing is not performed at higher than 100°C (*Monti* col. 4, lines 65-67). At the time of the invention, it would have been obvious to a person having ordinary skill in the art to ensure that the mixing temperature is below 100°C with the motivation of preventing undesirable side-reactions such as oxidation or decomposition.

Claims 29-31, 35-37 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,545,090 to *Demirors et al.* in view of U.S. Patent No. 4,493,922 to *Echte et al.*, further in view of U.S. Patent No. 4,785,051 to *Henton et al.* A table from “CRC Handbook of Solubility Parameters and Other Cohesion Parameters” by *Barton* (Edition 2, 1991, page 406) is used for supporting evidence.

Regarding claim 29: *Demirors* teaches a mass-suspension process (*Demirors* col. 5, lines 25-30) for the preparation of a rubber-reinforced vinyl aromatic copolymer. This process consists of:

i.) preparing a solution of rubber particles (dissolving rubber in styrene monomers; col. 6, lines 55-58). The rubber comprises a bimodal mixture of polymer particles (col. 6, lines 23-30), which are homopolymers (100%) of 1,3 alkadienes (e.g. butadiene, isoprene, chloroprene, piperylene; col. 3, line 65 through col. 4, line 10).

ii.) the solution is polymerized at 60-190°C in the presence of initiators (col. 10, lines 13-16). Chain transfer agents are taught (col. 10, lines 5-6). Phase inversion occurs during the polymerization (col. 7, lines 29-55), and the period of time wherein

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polymerization is occurring prior to this is analogous to the phrase “pre-polymerization” in the recited claim.

iii.) polymerization continues after phase inversion (col. 7, line 55 through col. 8, line 17). Suspension agents are added (col. 9 line 62 through col. 10, line 5); and

iv.) the polymerization is completed.

The recovered rubber-reinforced vinyl aromatic (co)polymer consists of 80-98% styrene (calculated from subtraction of rubbery particles) and 2-20% rubbery particles (col. 5, lines 50-57). Of the rubber particles, 20-60% have “core-shell” morphology (i.e. 0.1-2 microns) and 20-60% have “salami” morphology (i.e. 2-8 microns); (col. 6, lines 17-22). In the case where the claimed ranges overlap or lie inside ranges disclosed by the prior art a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191USPQ 90 (CCPA 1976). See MPEP § 2144.05. At the time of the invention, it would have been obvious to a person having ordinary skill in the art to optimize the ratios of the core-shell and salami particles, with the motivation of obtaining a desirable balance of impact and tensile properties (col. 2, lines 13-15 and col. 5, lines 18-25).

*Demirors* does not teach that following phase inversion in step iii)., the prepolymer is suspended in an aqueous phase with suspending agents to complete the polymerization. *Henton* teaches the completion of bimodal-rubber filled styrene in the aqueous phase by means of aqueous polymerization with suspending agents (*Henton* col. 9, lines 29-67). *Demirors* and *Henton* are analogous art in that they are drawn to the same field of endeavor, namely high-impact polystyrenes containing bimodal rubbery filler. At the time of the invention, it would have been obvious to a person

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having ordinary skill in the art to complete the polymerization of *Demirors* in the aqueous phase, with the motivation of ensuring that small rubber particles are formed (*Henton* col. 6, lines 39-67), which results in moldable resins having good gloss (*Henton* col. 6, lines 1-7).

*Demirors* does not teach solubility parameters  $\delta$  of the rubber components nor states the rubber particles having a difference in solubility parameter  $\delta_1 - \delta_2 \geq 0.5$ . *Echte* shows impact-resistant polystyrenes containing particles of a bimodal distribution (col. 1, lines 35-50). The particles (b1) (i.e. "core-shell") comprise 60-95% by weight polybutadiene (with styrene as the balance; col. 1, lines 47-48 and col. 2, lines 17-20). The particles (b2) (i.e. "salami") comprise 5-40% polybutadiene, and the balance styrene (col. 1, lines 49-50). The table from *Barton* is copied below:

**TABLE I**  
**Preferred Hildebrand Parameter**  
**Values for Selected Polymers**

Polymer	$\delta$ /MPa <sup>1/2</sup>
Polyacrylonitrile	26
Polybutadiene	17.0
Poly(methyl acrylate)	18.5
Cellulose acetate	24
Cellulose nitrate	21
Polychloroprene	18.5
Poly(dimethylsiloxane)	15.5
Ethyl cellulose	20
Polyethylene	17.0
Poly(ethylene oxide)	24
Poly(ethyl methacrylate)	18.5
Polyisobutylene	16.5
Polyisoprene	17.0
Poly(methyl acrylate)	20.5
Poly(methyl methacrylate)	19.0
Polypropylene	16.5
Polystyrene	18.5
Poly(tetrafluoroethylene)	13
Poly(vinyl acetate)	20
Poly(vinyl chloride)	19.5

On a weight-average between 5% polybutadiene and 95% styrene, the examiner calculates the “salami” particles to have a  $\delta_1$  of 18.42  $((0.05 * 17) + (0.95 * 18.5))$ . At 95% polybutadiene and 5% polybutadiene, the examiner calculates the “core-shell” particles to have a  $\delta_2$  of 17.075  $((0.95 * 17) + (0.05 * 18.5))$ . This is a difference of :

$\delta_1 - \delta_2 = \underline{1.345}$ . This is a sample calculation using the parameters taught by *Echte*; less extreme values of the polybutadiene/polystyrene ratio, within the claimed ranges of *Echte* would show a difference larger than 0.5, and all values between 0.5-1.345 can be achieved. *Demirors* and *Echte* are analogous art in that they are drawn to the same field of endeavor, namely high-impact polystyrenes utilizing bimodal 1,3-alkadiene rubbery particles. At the time of the invention, it would have been obvious to a person having ordinary skill in the art to use the process taught by *Demirors* to incorporate rubbery particles with a difference in solubility parameter  $\delta_1 - \delta_2 \geq 0.5$  (as taught by *Echte*), with the motivation of creating an impact-resistant styrene combining high gloss and good mechanical properties (col. 1, lines 27-35).

Regarding claim 30: *Demirors* in combination with *Echte* and *Henton* teaches the composition made by the process of claim 29, as set forth above.

Regarding claim 31: *Demirors* teaches particles with a “core shell” morphology with an average diameter of 0.2-1.5  $\mu\text{m}$  and particles with a salami morphology from 2.5-5  $\mu\text{m}$  (*Demirors* col. 6, lines 23-30). These particles overlap with the recited ranges, but the “core shell” particles have not been held to overlap with sufficient specificity.

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*Echte* teaches a rubber-reinforced vinyl-aromatic copolymer (col. 1, lines 7-12).

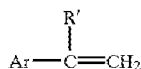
This polymeric material comprises a vinyl aromatic polymer matrix (polystyrene) from 70-97% (col. 1, lines 41-43), and bimodal particles consisting of:

- 1.) "core-shell" particles (0.2-0.6  $\mu\text{m}$ ; col. 1, lines 47-48) 60-95% wt. (col. 2, lines 4-5)
- 2.) "salami" particles (2-8  $\mu\text{m}$ ; col. 1, lines 49-50) at 5-40% wt. (col. 2, lines 27-30).

In *Echte*, the particle sizes of both core shell and salami particles have been held to overlap with sufficient specificity. In the case where the claimed ranges overlap or lie inside ranges disclosed by the prior art a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191USPQ 90 (CCPA 1976). See MPEP § 2144.05. At the time of the invention, it would have been obvious to a person having ordinary skill in the art to optimize the particle size, with the motivation of enhancing the glossiness and mechanical properties (*Echte* col. 1, lines 27-30), which are directly dependent on the particle morphologies (*Echte* col. 1, lines 30-35).

Regarding claim 35: *Demirors* teaches isoprenes as a preferred 1,3 conjugated diene (*Demirors* col. 3 line 65 through col. 4, line 10) from a short list of 1,3 dienes. Viscosities of 300 centipoise are taught (*Demirors* col. 4, lines 12-24).

Regarding claim 36: *Demirors* teaches the vinyl aromatic as (*Demirors* col. 3, line 25):





Wherein R is hydrogen or methyl and Ar is an optionally substituted aromatic ring (*Demirors* col. 3, lines 27-30). Styrene, alpha-methyl styrene, and other named compounds teach the recited structure with sufficient specificity (*Demirors* col. 3, lines 25-40).

Regarding claim 37: *Demirors* teaches preparing the composition in an inert solvent (col. 7, lines 10-13) present at 2-30% by weight (col. 7, lines 25-27). In the case where the claimed ranges overlap or lie inside ranges disclosed by the prior art a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191USPQ 90 (CCPA 1976). See MPEP § 2144.05. At the time of the invention, it would have been obvious to a person having ordinary skill in the art to optimize the solvent between 5-20% by weight, with the motivation of managing the processability and heat transfer during polymerization (col. 7, lines 20-25).

Regarding claim 39: *Demirors* teaches the polymerization occurring in a stirred-tank reactor (col. 9, line 39). In the absence of added pressure the reaction has been interpreted to be polymerized at 1.01 bar (atmospheric pressure). A substantially overlapping temperature range varying between 60 and 190°C is taught (col. 10, lines 13-16). In the case where the claimed ranges overlap or lie inside ranges disclosed by the prior art a *prima facie* case of obviousness exists. *In re Wertheim*, 541 F.2d 257, 191USPQ 90 (CCPA 1976). See MPEP § 2144.05. At the time of the invention, it would have been obvious to a person having ordinary skill in the art to optimize the reaction temperature between 70-150°C with the motivation of obtaining a high-molecular weight resin exhibiting fewer side-products.

Claims 32-34 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,545,090 to *Demirors et al.* in view of U.S. Patent No. 4,493,922 to *Echte et al.*, and U.S. Patent No. 4,785,051 to *Henton et al.* with evidence from "CRC Handbook of Solubility Parameters and Other Cohesion Parameters" by *Barton* (Edition 2, 1991, page 406), as applied to claim 29 above, further in view of U.S. Patent No. 5,942,575 to *Monti et al.*

Regarding claims 32-34: The combination of *Demirors*, *chte* and *Henton* teaches the process of claim 29, as set forth above.

*Demirors* is silent regarding the rubber  $\delta_1$  being a linear diblock rubber of S-B type, wherein S is a polystyrene block having an average molecular weight MW between 5,000-80,000 and B is a polybutadiene block with an average molecular weight MW between 2,000-250,000, wherein the S-block is 10-50% by weight of the rubber. *Monti* teaches rubber-reinforced vinyl aromatic polymers wherein S is a polystyrene block having an average molecular weight MW between 5,000-80,000 and B is a polybutadiene block with an average molecular weight MW between 2,000-250,000; the S-block comprises 10-50% by weight of the S-B rubber (*Monti*, 3:58-4:3). *Monti* shows an example wherein the polystyrene S block content is 40% by weight and the viscosity in 5% styrene is 40 cPs (col. 5, lines 40-45). *Demirors* and *Monti* are analogous art in that they are drawn to the same field of endeavor, namely rubber-reinforced vinyl aromatic compositions prepared by mass-continuous processes. At the time of the invention, it would have been obvious to a person having ordinary skill in the art to

ensure that the particles of *Demirors* have the molecular weights of *Monti*, with the motivation of ensuring that the particles are capable of forming fine-morphology in the polymer matrix (*Monti* col. 3, lines 55-60).

Claim 38 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,545,090 to *Demirors et al.* in view of U.S. Patent No. 4,493,922 to *Echte et al.*, and U.S. Patent No. 4,785,051 to *Henton et al.* with evidence from “CRC Handbook of Solubility Parameters and Other Cohesion Parameters” by *Barton* (Edition 2, 1991, page 406), as applied to claim 37 above, further in view of U.S. Patent No. 5,942,575 to *Monti et al.*

Regarding claim 38: The combination of *Demirors* and *Echte* and *Henton* teaches the process of claim 29, as set forth above.

*Demirors* is silent regarding the process wherein the solution is prepared in a mixer maintained at a temperature not higher than 100°C. *Monti* teaches that mixing is not performed at higher than 100°C (*Monti* col. 4, lines 65-67). At the time of the invention, it would have been obvious to a person having ordinary skill in the art to ensure that the mixing temperature is below 100°C with the motivation of preventing undesirable side-reactions such as oxidation or decomposition.

### ***Response to Arguments***

The following responses are directed to the document entitled “Remarks/Arguments” received on February 4<sup>th</sup>, 2010.

**A)** Amendments to the claims to correct issues of minor informalities and indefiniteness under 35 U.S.C. 112, second paragraph have been noted. Any objections or rejections from the Action of October 7<sup>th</sup>, 2009 and not repeated herein have been withdrawn.

**B)** Applicant's arguments with respect to the rejection of claims 17-39 under 35 U.S.C. § 103(a) over *Demirors* (USPN 6,545,090) in view of *Echte* (USPN 4,493,922) have been fully considered but they are not persuasive.

**1)** Applicant argues (pages 10-11) that the composition resulting from the combination of *Demirors* and *Echte* does not have a bimodal particle distribution.

In response, while it is noted that *Demirors* teaches a generally broadened rubber particle size distribution (*Demirors* col. 6, lines 5-9), the preferred embodiment of *Demirors* consists of bimodality; the preferred particle sizes do not overlap (see *Demirors* col. 6, lines 23-30), necessitating a complete absence of particles in the intermediate range.

Furthermore, *Echte* teaches also a composition wherein there is a void between the two particle sizes; the smaller particles having 0.2-0.6  $\mu\text{m}$  distribution, and the larger particle sizes range from 2-8  $\mu\text{m}$  (*Echte* col. 2, lines . As these two discrete particle sizes are used, intermediate particle sizes can not occur unless Applicant has evidence to the contrary. This has been interpreted to meet the limitation of "strictly bimodal".

Since *Demirors* prefers rubbery particles that do not have intermediate dimensions, and since *Echte* attributes the particles of '922 as resulting in compositions

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having high gloss and good mechanical properties, a person having ordinary skill in the art would be motivated to ensure that the particles of *Demirors* have bimodality to enhance both the gloss and mechanical properties.

**2)** Applicant argues (pages 12-14) that a person having ordinary skill in the art would not have motivation to use incompatible rubbery particles such that the solubility parameter  $\delta_1 - \delta_2 \geq 0.5$  is met.

In response, *Echte* shows the use of incompatible rubbery particles, as calculated above. *Echte* attributes the particles of '922 as an improvement over the prevailing art, in that the bimodality and incompatibility of the rubbery particles result in HIPS that show both high gloss and good mechanical properties (*Echte* col. 1, lines 25-30). *Echte* recognizes that previous embodiments are only capable of obtaining improvement in one of these areas (*Echte* col. 1, lines 5-25). Since *Demirors* is concerned with improving both of these properties (*Demirors* col. 6, lines 5-12), ensuring that the particles have a solubility parameter  $\delta_1 - \delta_2 \geq 0.5$  (as shown by *Echte*) is an obvious means of improving the mechanical properties and gloss.

### ***Prior Art***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

- *Burke* "Solubility Parameters: Theory and Application" (pages 1-6, 1984) teaches different units by which Hildebrand solubility parameters are measured.

***Correspondence***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MICHAEL A. SALVITTI whose telephone number is (571)270-7341. The examiner can normally be reached on Monday-Thursday 8AM-7PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Eashoo can be reached on (571) 272-1197. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/Mark Eashoo/  
Supervisory Patent Examiner, Art Unit 1796

/M. A. S./  
Examiner, Art Unit 1796